

Docket No. F-7312

Ser. No. 10/068,100

**AMENDMENTS TO THE CLAIMS:**

Please replace the claims with the claims provided in the listing below wherein status, amendments, additions and cancellations are indicated.

1-4. (Cancelled)

5. (Previously Presented) A ball bearing, comprising:

a pair of bearing rings, concentrically disposed such that a first bearing ring of said pair, having a first radius, and a second bearing ring of said pair, having a second radius, said second radius being greater than said first radius, are positioned such that said first bearing ring is radially inward of said second bearing ring;

an annular cage, positioned between said first and second bearing rings, said annular cage having a plurality of cylindrical through pockets positioned around a circumference thereof, each said through pocket being oriented in a radial direction through said circumference of said annular cage; and

a plurality of balls, corresponding in number to a number of said through pockets in said circumference of said annular cage, such that each ball is housed in a corresponding one of said through pockets, wherein

said annular cage is guided by one of said bearing rings;

Docket No. F-7312

Ser. No. 10/068,100

a relationship between a guide clearance  $\alpha$  and a pocket clearance  $\beta$  if is such that  $x + y < \alpha < \beta + x$ , where said guide clearance of said annular cage with respect to said one bearing ring is  $\alpha$ , said pocket clearance of a pocket inner wall face with respect to said ball is  $\beta$ , an expansion amount of said annular cage in said radial direction due to rotational centrifugal force is  $x$ , and an expansion amount of said annular cage in said radial direction due to thermal expansion is  $y$ ; and

such that said inner wall surface of said pockets of said cage does not interfere with said balls, even if said cage becomes off-centered.

6. (Previously Presented) The ball bearing according to claim 5, wherein races having arcuate sectional shapes are provided to said inner and outer bearing rings and said balls are in contact with said races in both said bearing rings at predetermined contact angles.

7. (Previously Presented) A ball bearing, comprising:

a pair of bearing rings, concentrically disposed such that a first bearing ring of said pair, having a first radius, and a second bearing ring of said pair, having a second radius, said second radius being greater than said first radius, are

Docket No. F-7312

Ser. No. 10/068,100

positioned such that said first bearing ring is radially inward of said second bearing ring;

an annular cage, positioned between said first and second bearing rings, said annular cage having a plurality of cylindrical through pockets positioned around a circumference thereof, each said through pocket being oriented in a radial direction through said circumference of said annular cage; and

a plurality of balls, corresponding in number to a number of said through pockets in said circumference of said annular cage, such that each ball is housed in a corresponding one of said through pockets, wherein

said annular cage is guided by one of said bearing rings;

a relationship between a guide clearance  $\alpha$  and a pocket clearance  $\beta$  at  $\alpha_{\max}$   $< \beta_{\min} + x$  and  $\alpha_{\min} > x + y$  if said guide clearance of said annular cage with respect to said one bearing ring is  $\alpha$ , said pocket clearance of a pocket inner wall face with respect to said ball is  $\beta$ , an expansion amount of said annular cage in said radial direction due to rotational centrifugal force is  $x$ , an expansion amount of said annular cage in said radial direction due to thermal expansion is  $y$ , a maximum value of said guide clearance  $\alpha$  is  $\alpha_{\max}$ , a minimum value of said guide clearance  $\alpha$  is  $\alpha_{\min}$ , and a minimum value of said pocket clearance  $\beta$  is  $\beta_{\min}$ ; and

such that said inner wall surface of said pockets of said cage does not interfere with said balls, even if said cage becomes off-centered.

Docket No. F-7312

Ser. No. 10/068,100

8-9. (Cancelled)

10. (Previously Presented) A ball bearing, comprising:

an inner ring having a race with an arcuate sectional shape on an outer peripheral face in an axial intermediate position and a counter bore with a diameter gradually reducing from said race toward axial one end side;

an outer ring disposed outside said inner ring and concentrically with said inner ring and having a race with a sectional shape corresponding to a part of an arc on an inner peripheral face in an axial intermediate position;

an annular cage having cylindrical through pockets along said radial direction in several positions on a circumference and incorporated between said inner ring and said outer ring;

a plurality of balls each housed in each said pocket in said annular cage and rolling in said respective races of said inner ring and said outer ring,

wherein

said annular cage is guided by said outer ring, and

a range representing an eccentricity tolerance in which said annular cage can rotate in an eccentric manner between said inner and outer rings is included in a range representing a rattling tolerance in which said annular cage can move in a state in which said balls are fixed by setting a relationship between a guide

Docket No. F-7312

Ser. No. 10/068,100

clearance  $\alpha$  and a pocket clearance  $\beta$  at  $x+y < \alpha < \beta+x$  if said guide clearance of said annular cage with respect to said inner ring is  $\alpha$ , said pocket clearance of a pocket inner wall face with respect to said ball is  $\beta$ , an expansion amount of said annular cage in said radial direction due to rotational centrifugal force is  $x$ , and an expansion amount of said annular cage in said radial direction due to thermal expansion is  $y$ ; and

such that said inner wall surface of said pockets of said cage does not interfere with said balls, even if said cage becomes off-centered.

11. (Cancelled)

12. (Currently Amended) A ball bearing, comprising:

an outer ring having a race with an arcuate sectional shape on an inner peripheral face in an axial intermediate position and a counter bore with a diameter gradually increasing from said race toward axial one end side;

an inner ring disposed inside said outer ring and concentrically with said outer ring and having a race with a sectional shape corresponding to a part of an arc on an outer peripheral face in an axial intermediate position;

Docket No. F-7312

Scr. No. 10/068,100

an annular cage having cylindrical through pockets along said radial direction in several positions on a circumference and incorporated between said inner ring and said outer ring;

a plurality of balls each housed in each said pocket in said annular cage and rolling in said respective races of said inner ring and said outer ring, wherein said annular cage is guided by said inner ring, and

a range representing an eccentricity tolerance in which said annular cage can rotate in an eccentric manner between said inner and outer rings is included in a range representing a rattling tolerance in which said annular cage can move in a state in which said balls are fixed by setting a relationship between a guide clearance  $\alpha$  and a pocket clearance  $\beta$  at  $\alpha < \beta$  if said guide clearance of said annular cage with respect to said inner ring is  $\alpha$  and said pocket clearance of a pocket inner wall face with respect to said ball is  $\beta$ ;

such that said inner wall surface of said pockets of said cage does not interfere with said balls, even if said cage becomes off-centered; and

The ball bearing according to claim 11, wherein said eccentricity tolerance of said annular cage is included in said rattling tolerance of said annular cage by setting said relationship between said guide clearance  $\alpha$  and said pocket clearance  $\beta$  at  $x+y < \alpha < \beta+x$  if an expansion amount of said annular cage in said radial

Docket No. F-7312

Ser. No. 10/068,100

direction due to rotational centrifugal force is  $x$  and an expansion amount of said annular cage in said radial direction due to thermal expansion is  $y$ .